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EXAMINER	
DAY, HERNG DER	

ART UNIT	PAPER NUMBER
2128	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/707,781	OLSSON, KARL-ERIK	
	Examiner	Art Unit	
	HERNG-DER DAY	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 February 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *29-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *29-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 September 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to Applicant's Amendment and Response ("Response") to Office Action dated November 13, 2009, filed February 2, 2010.

1-1. Claims 29, 30, and 42 have been amended. Claim 43 has been added. Claims 29-43 are pending.

1-2. Claims 29-43 have been examined and rejected.

Specification

2. The amended paragraphs to the specification filed on February 2, 2010, are approved.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 29-41 and 43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4-1. Independent claim 29 recites the limitation, "b) ... the *maximum temperature* is calculated using one function if the heating parameter is less than a predefined limit value; using another function if the heating parameter is greater than said predefined limit value, said another function intersecting said one function at said predefined limit value; and using either said one function or said another function if the heating parameter is equal to said predefined limit value"

in lines 9-13 of the claim, which is vague and indefinite because as recited in dependent claim 35 "wherein the *maximum temperature* is calculated in said step b) by summing a base temperature of the rotary member and a *temperature rise* associated with the given cycle of heat-generating loading" and in dependent claim 36 "wherein the *temperature rise* is calculated using said one function if the heating parameter is less than said predefined limit value, using said another function if the heating parameter is greater than said predefined limit value, and using either said one function or said another function if the heating parameter is equal to said predefined limit value". In other words, claim 35 calculates Tmax (i.e., maximum temperature) = Tbase (i.e., base temperature) + Trise (i.e., temperature rise). However, both Tmax (as calculated in claim 29) and Trise (as calculated in claim 36) are calculated using the same said one function or said another function which implies that Tmax equals to Trise and Tbase is always zero. Clarification of the metes and bounds, via clearer claim language, is requested.

4-2. Claim 30 recites the limitation, "where t is the length of time for which the rotary member is subject to *a given cycle* of heat-generating loading" in lines 4-5 of the claim, which is vague and indefinite because it is unclear whether the recited "*a given cycle*" is the same as the recited "*a given cycle*" in line 5 of claim 29.

4-3. Claim 41 recites the limitation, "said signal that is indicative of the cumulative amount of heating-induced damage which has occurred to said rotary member specifies the amount of life remaining in said rotary member" in lines 1-3 of the claim, which is vague and indefinite because said signal indicates and/or specifies representations of two mutually exclusive conditions. In other words, the cumulative amount of heating-induced damage and the amount of life remaining are representations of two mutually exclusive conditions; however, the recited

"said signal" indicates and/or specifies both representations. Clarification of the metes and bounds, via clearer claim language, is requested.

4-4. Claim 43 recites the limitation, "where t is the length of time for which the rotary member is subject to *a given cycle* of heat-generating loading" in lines 2-3 of the claim, which is vague and indefinite because it is unclear whether the recited "*a given cycle*" is the same as the recited "*a given cycle*" in line 5 of claim 42.

4-5. Claims not specifically rejected above are rejected as being dependent on a rejected claim.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 29-31, 33, and 35-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lauster et al., "Thermic Computations in Multiple-Disk Clutches", translated into English by USPTO from "Waermetechnische Berechnungen bei Lamellenkupplungen", VD1-Z 115 (1973), pages 122-126, (IDS filed January 23, 2008, non-patent literature document cite no. 1), in view of Fatemi et al., "Cumulative Fatigue Damage and Life Prediction Theories: A Survey of the State of the Art for Homogeneous Materials", International Journal of Fatigue, January 1998, pages 9-34.

6-1. Regarding claim 29, Lauster et al. disclose a method for assessing heating-induced, life-affecting damage to a rotary member that is subjected to cyclical, heat-generating loading, said method comprising:

a) calculating a heating parameter that is based on the thermal diffusivity constant α of the rotary member and the length of time for which the rotary member is subject to a given cycle of heat-generating loading, where $\alpha = \lambda/(\rho*c)$, λ is the thermal conductivity of the rotary member, ρ is the density of the rotary member, and c is the heat capacity of the rotary member (Fourier characteristic Fo, equation (7), page 7, paragraph 3);

b) calculating a maximum temperature associated with the rotary member for the given cycle of heat-generating loading, wherein the maximum temperature is calculated using one function if the heating parameter is less than a predefined limit value (a solution using the heat source process is given; ... but only for Fourier numbers Fo < 0.5, page 7, the last second line, through page 8, line 2); using another function if the heating parameter is greater than said predefined limit value (Accordingly, for Fo > 0.5 the following applies, equation (8), page 9, paragraph 3).

Lauster et al. fail to expressly disclose said another function intersecting said one function at said predefined limit value; and using either said one function or said another function if the heating parameter is equal to said predefined limit value. Nevertheless, Lauster et al. disclose in page 8, second paragraph, an analytic solution approach using a Laplace transform may apply to all Fo numbers. In other words, a continuous solution (by Laplace transform) to equation (5) does exist even for Fo = 0.5.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Lauster et al. to ensure that both solution functions will

have the same value at Fo = 0.5 (i.e., both functions are intersected at Fo = 0.5) because, as Lauster et al. suggested in page 8, paragraph 2, an analytic solution (by Laplace transform) to equation (5) does exist to all Fo numbers including Fo = 0.5.

Lauster et al. also fail to expressly disclose steps c), d), e), and wherein said steps a) through e) are executed automatically on electronic computing means and wherein said method further comprises outputting from said electronic computing means a signal that is indicative of the cumulative amount of heating-induced damage which has occurred to said rotary member.

Fatemi et al. disclose in page 10, paragraph 4, "Miner first represented the Palmgren linear damage concept in mathematical form as the LDR presented by: $D = \Sigma r_i = \Sigma n_i/N_{fi}$", and in Abstract, "Fatigue damage increases with applied load cycles in a cumulative manner. Cumulative fatigue damage analysis plays a key role in life prediction of components and structures subjected to field load histories."

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Lauster et al. to incorporate the teachings of Fatemi et al. because, as Fatemi et al. suggested, Miner's mathematical form as the LDR is used to represent the Palmgren linear damage concept in a cumulative manner (steps c), d), e)) and applying (outputting) the cumulative fatigue damage analysis plays a key role in life prediction of components and structures subjected to field load histories.

6-2. Regarding claim 30, Lauster et al. further disclose wherein said heating parameter is a Fourier constant Fo, with $Fo = 4*\alpha*t/S^2$, where t is the length of time for which the rotary member is subject to a given cycle of heat-generating loading and S is the thickness of the rotary member (Fourier characteristic Fo, equation (7), page 7, paragraph 3).

6-3. Regarding claim 31, Lauster et al. further disclose wherein the maximum temperature associated with the rotary member calculated in said step b) is a surface temperature of the rotary member (the maximum boundary temperature, page 9, paragraph 2).

6-4. Regarding claim 33, Lauster et al. further disclose wherein said one function and said another function are each linear when depicted on a logarithmic-by-logarithmic graph with the logarithm of a heating-related quantity depicted as a function of the logarithm of said heating parameter (equation (8), page 9, paragraph 3; equation (8) is a power function of Fo, therefore, it is linear when depicted on a logarithmic-by-logarithmic graph).

6-5. Regarding claim 35, Lauster et al. further disclose wherein the maximum temperature is calculated in said step b) by summing a base temperature of the rotary member and a temperature rise associated with the given cycle of heat-generating loading
(${}_{02} = {}_{u1} + {}_{01}$, page 14, line 19).

6-6. Regarding claim 36, Lauster et al. further disclose wherein the temperature rise is calculated using said one function if the heating parameter is less than said predefined limit value (a solution using the heat source process is given; ... but only for Fourier numbers Fo < 0.5, page 7, the last second line, through page 8, line 2), using said another function if the heating parameter is greater than said predefined limit value (Accordingly, for Fo > 0.5 the following applies, equation (8), page 9, paragraph 3).

Lauster et al. fail to expressly disclose using either said one function or said another function if the heating parameter is equal to said predefined limit value. Nevertheless, Lauster et al. disclose in page 8, second paragraph, an analytic solution approach using a Laplace transform may apply to all Fo numbers. In other words, a continuous solution (by Laplace transform) to equation (5) does exist even for Fo = 0.5.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Lauster et al. to ensure that both solution functions will have the same value at Fo = 0.5 (i.e., both functions are intersected at Fo = 0.5) because, as Lauster et al. suggested in page 8, paragraph 2, an analytic solution (by Laplace transform) to equation (5) does exist to all Fo numbers including Fo = 0.5.

6-7. Regarding claim 37, Lauster et al. further disclose wherein said base temperature is calculated by accounting for cooling of the rotary member between the end of the heat-generating loading cycle that immediately precedes said given heat-generating loading cycle and the beginning of said given heat-generating loading cycle (the final temperature upon cooling in the first cycle forms the initial temperature for the re-heating in the next cycle, page 14, paragraph 2).

6-8. Regarding claim 38, Lauster et al. further disclose wherein said rotary member is disk in a clutch or a brake (The heat flux into the *disk* can be acquired for transient heat condition with a differential Fourier equation, page 6, paragraph 3).

6-9. Regarding claim 39, Lauster et al. further disclose wherein said rotary member is a gearwheel in a gear train (in the practice of automatic transmissions of passenger cars, page 9, paragraph 2).

6-10. Regarding claim 40, Fatemi et al. further disclose wherein said signal that is indicative of the cumulative amount of heating-induced damage which has occurred to said rotary member specifies the amount of damage that has occurred to said rotary member (Miner first represented the Palmgren linear damage concept in mathematical form as $D = \Sigma r_i = \Sigma n_i/N_{fi}$, page 10, paragraph 4; Fatigue damage increases with applied load cycles in a cumulative manner, Abstract).

6-11. Regarding claim 41, Fatemi et al. further disclose wherein said signal that is indicative of the cumulative amount of heating-induced damage which has occurred to said rotary member specifies the amount of life remaining in said rotary member (Miner first represented the Palmgren linear damage concept in mathematical form as $D = \Sigma r_i = \Sigma n_i/N_{fi}$, page 10, paragraph 4; Cumulative fatigue damage analysis plays a key role in *life prediction* of components and structures subjected to field load histories, Abstract).

6-12. Regarding claims 42 and 43, these computer program product claims include equivalent method limitations as in claims 29 and 30 and are unpatentable using the same analysis of claims 29 and 30.

Allowable Subject Matter

7. Dependent claims 32 and 34 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and overcome the above rejections under 35 U.S.C. 112, second paragraph.

Applicant's Arguments

8. Applicant argues the following:

(1) "Thus, if maximum temperature T is calculated in the disclosed embodiment using the maximum temperature increase ΔT (i.e., by adding it to the pre-loading temperature), and if the maximum temperature increase ΔT is calculated using different functions depending on the value of the heating parameter, then it follows that the maximum temperature T is calculated using different functions (which "feed into" the value of ΔT) depending on the value of the heating parameter." (Page 8, paragraph 1, Response)

(2) "Per agreement at the interview, Applicant has specified in independent claims 29 and 42 that the parameter is based on the thermal diffusivity constant α of the rotary member and the length of time for which the rotary member is subject to a given cycle of heat-generating loading, with the definition of α being provided in the specification as well as in the claims. (Page 8, paragraph 2, Response)

(3) "Claims 29-42 are rejected under 35 U.S.C. § 112, second paragraph (section 10-1 of the Office Action) for alleged indefiniteness. In particular, the Examiner astutely notes that ..., the claims need to specify that the functions intersect at the predefined limit value, such that the same result is obtained using either function, in order to avoid ambiguity. Applicant has amended the claims accordingly and requests that the rejection be withdrawn." (Page 8, paragraph 3, through page 9, paragraph 1, Response)

(4) "it should be apparent that the equations at paragraphs [0086] and [0087] were rearranged to express N in terms of T and ml or m2, and those rearranged expressions were then substituted into the fundamental expression for accumulated damage. That substitution leads us to the amendments Applicant submitted previously, which simply made explicit that which had been done implicitly and, in so doing, corrected a clear error." (Page 15, paragraph 1, Response)

Response to Arguments

9. Applicant's arguments have been fully considered.

9-1. Applicant's argument (1) is persuasive. However, in view of the limitations recited in claims 35 and 36, the limitation recited in claim 29, lines 9-11, "b) ... the *maximum temperature* is calculated using one function if the heating parameter is less than a predefined limit value; using another function if the heating parameter is greater than said predefined limit value" is

vague and indefinite as detailed in paragraph **4-1** above. Specifically, claim 35 calculates Tmax (i.e., maximum temperature) = Tbase (i.e., base temperature) + Trise (i.e., temperature rise). However, both Tmax (as calculated in claim 29) and Trise (as calculated in claim 36) are calculated using the same said one function or said another function which implies that Tmax equals to Trise and Tbase is always zero.

9-2. Applicant's argument (2) is persuasive. The rejections of claims 29 and 31-42 under 35 U.S.C. 112, first paragraph, in Office Action dated November 13, 2009, have been withdrawn.

9-3. Applicant's argument (3) is persuasive. The rejections of claims 29-42 under 35 U.S.C. 112, second paragraph, in Office Action dated November 13, 2009, have been withdrawn.

9-4. Applicant's argument (4) is persuasive. The rejections of claims 29-42 under 35 U.S.C. 112, first paragraph, in Office Action dated November 13, 2009, have been withdrawn.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Herng-der Day whose telephone number is (571) 272-3777. The Examiner can normally be reached on 9:00 - 17:30.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: (571) 272-2100.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kamini S. Shah can be reached on (571) 272-2279. The fax phone numbers for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Kamini S Shah/
Supervisory Patent Examiner, Art Unit 2128

/Herng-der Day/
Examiner, Art Unit 2128

May 24, 2010